

The Fresh Fish Market in Hawaii

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INTRODUCTION

The ocean and its environs have predominated in shaping the lives of Hawaii's people. Before the 20th century, Hawaiians were dependent on the sea for a major portion of their food; today, the ocean still plays an important role in the lives of Hawaii's residents, providing recreation, food, and transportation. People in Hawaii consume more seafood per capita than any other state in the Union. Noncommercial, small-scale fishing is still important in some regions of the State although its importance relative to the overall fishing industry is not known. Recreational fishing is also significant, and although the actual quantity of fish from this source is also unknown, it has been estimated that approximately 1.5 million man-hours (720 man-years) are expended annually in this activity (5).

In the past, Hawaii's fisheries occupied an important place in the Islands' economy, but their growth has not kept pace with that of other sectors of the economy. Instead, imports contribute a significant portion of the fish, shellfish, and seaweed consumed in Hawaii. Marine products are shipped from Japan, the Pacific Northwest, Australia, New Zealand, and elsewhere. In short, Hawaii's marine environment contributes little to the total economy in terms of seafood. In 1971, the commercial fish landings amounted to slightly more than \$5 million (14) or about .12 percent of the Gross State Product.

Many reasons can be advanced for the lack of growth of Hawaii's fisheries. Shang (12) suggests that the slow growth of the skipjack tuna industry is not due to overfishing; rather, a cost-revenue analysis indicates that, given past tuna prices and industry costs, the profit margins are too low (both absolutely and relative to those of other industries) to induce new investments. One reason for the low profits might be that local fishing technology is "primitive" compared to the fishing technology of other areas and nations: most of the fishing vessels here are old, with no modern fish-carrying and fish-keeping facilities. Another possibility is that the market is not operating in a manner conducive to expansion.

This study is concerned with the latter possibility. It presents a description of the major structural characteristics of the fresh fish market in Hawaii. Its focus is the City and County of Honolulu, which is the principal landing point for fish and the principal location of fish-processing facilities, and which has over 80 percent of the State's population.

A market for any commodity can best be conceived as a system that links producers--in this case, fishermen--to the final consumers. To comprehend the functioning of a market, it is necessary to examine not only the exchange or price-making function but also the participants, the institutions affecting the market, and the evolution of the market.

In 1963, an economic evaluation of the fishing industry in Hawaii was completed by E.A. Hale (4) at the request of the State legislature. Among other things, Hale concludes that the present local market for fish is so small, so easily saturated, and so unattractive to businessmen that it apparently goes by default to a few established buyers. As a result, it lacks some of the economies and efficiencies found in large-scale operations. Hale also points out that although local protein-consumption habits are largely unknown, the trend may be away from consumption of local fresh fish, largely because of the high price and the heavy growing competition of frozen and canned fish from foreign and Mainland sources. In 1961, fish imports, mostly from Japan, accounted for \$5 million, and Mainland imports for another \$1 to \$2 million of a total retail value of \$12.6 to \$13.6 million of fish purchased by Hawaii's consumers.

Availability of Fish in Hawaii Waters

For the past two decades, the procurement or production level of the fish marketing chain has suffered from a declining number of fishing boats and from commercial fishermen who operate vessels inadequately equipped for distant waters. Currently, Hawaii's fishing fleet is characterized by relatively small boats that seldom venture more than 200 miles from shore. Local fishermen have been unable to supply the market with sufficient quantities of fish to keep dealers operating year round.

Commercial fish landings in the State of Hawaii in 1972 totaled 14.7 million pounds, valued at \$5,700,000 (14). Skipjack tuna (aku) comprised the largest part of this industry, with other fish constituting only 27 percent of the total commercial catch.

The level of activity in Hawaii's fishing industry is constrained by an absence of the shallow, rich banks typical of most of the world's great fishing areas. The Islands were generated by volcanic upheavals that formed a coastline that descends steeply to the ocean floor, more than 15,000 feet below sea level. Only 1560 square nautical miles off the principal Islands are shallower than 100 fathoms (9).

Figure 1 Seasonality of supply of selected fresh fish, periods of maximum harvest (based on 1962-1972 catches).

Species	Month											
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Aku (skipjack tuna)												
'Ahi (yellowfin tuna)												
'Ahi (bigeye tuna)												
Akule (bigeye scad)												
Halalu (bigeye scad)												
'Opelu (mackerel scad)												
Onaga (red snapper)												
A'u (marlin)												
Hapu'upu'u (sea bass)												
Kahala (amberjack)												
Kumu (goatfish)												
Mahimahi (dolphin)												
Ihu (red snapper)												
Moana (goatfish)												
'Opakapaka (snapper)												
'O'io (bone fish)												
Ulua (jack crevalle)												

The living marine resources of Hawaii are found on the reefs and in the inshore area--both relatively small--and in the open sea beyond the 100-fathom line. Large pelagic tuna, marlin, swordfish, and other fish enter the coastal and offshore waters of the Hawaii archipelago.

Although the waters surrounding the Islands provide favorable conditions for a dependable concentration of fish throughout the year, there are seasons when certain species are most abundant, the early summer months being the most important in terms of value and quantity. These seasonal fluctuations definitely limit the market. Figure 1 illustrates the seasonal availability of selected varieties of fish. The open sea provides by far the greatest portion of locally caught fish and has the greatest potential for further development. (Waters within 1500 miles of Honolulu provide Japanese longline fisheries with an estimated 100 million pounds of tuna a year.) (1)

Species of Fish Landed

According to the Fish and Game Division, more than a hundred different varieties of fish are caught in local waters, but only about 50 species are caught commonly (see Table 1). Species

Table 1. Local, common, and scientific names of fishes commonly caught in Hawaii waters

Local name	Common name	Scientific name
'A'awa	Spotted wrasse	<i>Bodianus bilineatus</i>
'Aha'aha	Needle fish	Belonidae (3 species)
'Ahi (menpachi shibi)	Bigeye tuna	<i>Parathunnus sibi</i>
'Ahi (maguro)	Bluefin tuna	<i>Thunnus orientalis</i>
'Ahi	Yellowfin tuna	<i>Neothunnus macropterus</i>
'Ahipalaha (tonbo)	Albacore tuna	<i>Germo alalunga</i>
Aholehole	Mountain bass	<i>Kuhlia sandvicensis</i>
Aku (katsuo)	Skipjack tuna	<i>Katsuwonus pelamis</i>
Akule (aji)	Bigeye scad	<i>Trachurus crumenophthalmus</i>
Ala-'ihi	Squirrel fish	Holocentridae (15 species)
'Ama'ama	Millet	<i>Mugil cephalus</i>
A'u (kajiki)	Striped marlin	<i>Makaira audax</i>
A'u (kurokajiki)	Pacific blue marlin	<i>Makaira amplia</i>
A'u	Broadbill swordfish	<i>Xiphias gladius</i>
A'u	Shortnosed spearfish or indian fish	<i>Tetrapterus angustirostris</i>
A'u (shirokajiki)	Black marlin	<i>Istiompax marlina</i>
A'u-lepe	Sailfish	<i>Istiophorus orientalis</i>
Awa	Milk fish	<i>Chanos chanos</i>
Awaawa	Ten pounder or lady fish	<i>Elops hawaiiensis</i>
'Aweoweo	Red bigeye	Priacanthidae (4 species)
Ea	Wrasse	Labridae
Hapu'upu'u	Sea bass	<i>Epinephelus quernus</i>
Hauliuli	Snake mackerel	<i>Gempylus serpens</i>
Hihimanu	Ray	Dasyatidae
Hilu	Wrasse	<i>Coris flavovittata</i>
Hinalea	Wrasse	Labridae
Hunuhunu (hage)	Triggerfish	Balistidae
'Iao (togoro)	Silverside	<i>Prionosus insularum</i>
Iheihe	Halfbeak	Hemiramphidae
Kahala	Amberjack	<i>Seriola dumerilii</i>
Kaku	Barracuda	<i>Sphyræna barracuda</i>
Kala	Surgeon fish or unicorn fish	<i>Naso unicornis</i>
Kalikali	Pink snapper	<i>Pristipomoides sieboldii</i>
Kamanu	Hawaiian salmon	<i>Elagatis bipinnulatus</i>
Kawakawa	Benito	<i>Euthynnus yaito</i>
Kaweiea	Japanese barracuda	<i>Sphyræna helleri</i>
Kihikihi	Moorish idol	<i>Zanclus cornutus</i>
Kole	Surgeon fish	<i>Ctenochaetus strigosus</i>
Kumu	Red goatfish	<i>Parupeneus porphyreus</i>
Kupipi	Damsel fish	<i>Abudefduf eoroides</i>
Kupoupou	Mongoose fish	<i>Cheilic inermis</i>
Lae	Leatherback	<i>Scomberoides sancti-petri</i>
Laenihi (nabeta)	Razorfish	<i>Iniistius pavoninus</i>
Lau'i-pala	Yellow tang	<i>Zebrasoma flavescens</i>
Lau-wiliwili (y. manini)	Long nose butterfly fish	<i>Forcipiger longirostris</i>
Lehi	Snapper	<i>Aphareus rutilans</i>
Mahimahi	Dolphin	<i>Coryphaena hippurus</i>
Maiii	Surgeon fish	Acanthuridae
Maiko	Surgeon fish	<i>Acanthurus nigroris</i>
Maikoiko	Surgeon fish	<i>Acanthurus leucopareus</i>
Makiawa	Sardine	<i>Etraneus micropus</i>
Malolo	Flying fish	Exocoetidae
Malu	Goatfish	<i>Parupeneus pleurostigma</i>
Manini	Convict tang	<i>Acanthurus sandvicensis</i>
Maomao (nanao)	Damsel fish	<i>Abudefduf abdominalis</i>
Moana	Goatfish	<i>Parupeneus multifasciatus</i>
Moelua	Red goatfish	<i>Mulloidichthys pflugeri</i>
Moi	Threadfish	<i>Polydactylus serfilis</i>
Mola mola	Ocean sunfish	Molidae
Mu	Snapper or porgy	<i>Monotaxis grandoculis</i>
Na'ena'e	Orange spotted tang	<i>Acanthurus olicaceus</i>
Nehu	Anchovy	<i>Stolephorus purpureus</i>

Table 1. (continued)

Local name	Common name	Scientific name
Nenue	Rudderfish	<i>Kyphosus cinerascens</i>
Nohu (hogo)	Common scorpion <u>or</u> rock cod or stonefish	<i>Scorpaenopsis caccopsis</i> , <i>S. gibbosa</i>
Nunu	Stickfish <u>or</u> trumpetfish	<i>Aulostomus chinensis</i>
O'ili lepa	Filefish	<i>Alutera scripta</i>
O'io	Bonefish	<i>Albula vulpes</i>
Onaka	Jack	<i>Caranx mate</i>
Ono	Wahoo	<i>Acanthocybium solandri</i>
O'opu-hue	Balloon fish	<i>Tetraodon hispidus</i>
Opakapaka	Pink snapper	<i>Pristipomoides microlepis</i>
Opelu	Mackerel scad	<i>Decapterus pinnulatus</i>
Opelu-mama	Mackerel scad	<i>Decapterus pinnulatus</i>
Opule	Spotted wrasse	<i>Anampses cavierni</i>
Paku	Flounder	<i>Bothus mancus</i> , <i>B. panterinus</i>
Paku'iku'i	Achilles tang	<i>Acanthurus achilles</i>
Palani	Surgeon fish	<i>Acanthurus dussumieri</i>
Papio	Jack crevalle	<i>Carangus</i> (13 species)
Pa'u'u	Squirrel fish	<i>Myripristis chrysers</i>
Piha	Small round herring	<i>Spratelloides delicatulus</i>
Pualu	Surgeon fish	<i>Acanthurus xanthopterus</i>
Roi	Blue spotted grouper	<i>Cephalopholis argus</i>
Saba	Japanese mackerel	<i>Scomber japonicus</i>
Uhu	Parrot fish	<i>Scaridae</i>
Ukikiki (gindai)	Snapper	<i>Rooseveltiella brighami</i>
Uku	Grey snapper	<i>Aprion virescens</i>
'Ula'ula (ehu)	Red snapper	<i>Etelis marshi</i>
'Ula'ula koae (onaga)	Red snapper	<i>Etelis carbunculus</i>
Ulua	Jack crevalle	<i>Carangus</i> (13 species)
Ulua kihikihi (kagami)	Thread crevalle	<i>Alectis ciliaris</i> , <i>A. indica</i>
Ulua omilu (hoshi)	Blue crevalle	<i>Caranx melampygus</i>
Uouoa	False mullet	<i>Neomyxus chaptalii</i>
'Upapalu	Cardinal fish	<i>Apogon nnyderi</i>
'U'u (menpachi)	Squirrel fish	<i>Myripristis argyromus</i> , <i>M. bernardi</i> , <i>M. multiradiatus</i>
Walu	Oil fish	<i>Ruvettus pretiosus</i>
Weke-'a'a	Goatfish	<i>Mulloidichthys samoensis</i>
Weke pahulu	Goatfish	<i>Upeneus arge</i>
Weke pueo	Goatfish	<i>Upeneus arge</i>
Weke-ula	Red goatfish	<i>Mulloidichthys auriflamma</i>
Weke-ula'ula	Red goatfish	<i>Mulloidichthys famneu</i>

Note: Several fish are also known by their Japanese names. The Japanese name when commonly used is given in parentheses alongside the Hawaiian name.

caught in abundance are aku, ahi, akule, kahala, opakapaka, kumu, weke, and opelu, with aku (skipjack tuna) being the most abundant.

THE DEMAND FOR FISH IN HAWAII

Hawaii is composed of people from a wide variety of ethnic and national backgrounds, including Japanese, Chinese, Filipino, Caucasian, Korean, Samoan, Portuguese, and Micronesian. Many of these people came from societies in which fish constituted a major portion of their diets. Today each ethnic group has retained some of its food habits and often has adopted some of the eating preferences of other groups. Naturally, each family varies greatly in the degree it has retained its old food habits and adopted new ones.

In the 1950s, fish consumption by local residents was almost triple the Mainland per capita fish consumption. In 1952, the annual home consumption of red meats, poultry, and fish was almost 157 pounds per capita, and various kinds of fish comprised 17 percent of all meats. The

per capita consumption of commercial marine food was about 40 pounds a year, as compared with a national average of about 10 pounds in 1965. The income and the relative economic positions of various ethnic groups were factors influencing meat purchases. It was found that consumption of local fish actually declined as income moved upward (10). However, these data were gathered in the early 1950s and the situation may be different today.

In Hawaii some species of fish are preferred over others by the various ethnic groups. Ethnicity, income, ethnic holidays, pay days, special occasions such as weddings, the level of Japanese tourism, and the seasonal availability of fish all affect the demand for fish and for particular varieties of fish.

Some species are popular or established with all nationalities, including akule, halalu, opelu, aku, and mahimahi. Hawaiians prefer or commonly buy aku, akule, opelu, bonefish, mano, lae,

Table 2. Fish species preferred by ethnic groups

Local name	Common name	Clientele by ethnicity
'Ahi	Yellowfin tuna	Japanese, Cosmopolitan
'Ahi (maguro)	Bluefin tuna	Japanese, Cosmopolitan
'Ahi (menpachi shibi)	Bigeye tuna	Japanese, Cosmopolitan
Aholehole	Mountain bass	Cosmopolitan
Aku (katsuo)	Skipjack tuna	Cosmopolitan
Akule (aji)	Bigeye scad	Cosmopolitan
'Ama'ama	Mullet	Chinese, Cosmopolitan
A'u	Marlin	Japanese, Cosmopolitan
Awa	Milk fish	Chinese, Filipino, Cosmopolitan
Awaawa	Ten pounder or lady fish	Chinese, Cosmopolitan
'Aweoweo	Red bigeye	Hawaiian, Chinese, Cosmopolitan
Halalu	Bigeye scad	Cosmopolitan
Hapu'upu'u	Sea bass	Chinese, Cosmopolitan
Hinalea	Wrasse	Filipino, Hawaiian, Chinese
Humuhumu (hage)	Triggerfish	Hawaiian, Cosmopolitan
Kaku	Barracuda	Chinese, Cosmopolitan
Kala	Surgeon fish or unicorn fish	Hawaiian, Filipino, Samoan, Cosmopolitan
Kahala	Amberjack	Japanese, Cosmopolitan
Kalikali	Pink snapper	Japanese, Cosmopolitan
Kawakawa	Bonito	Hawaiian, Filipino, Cosmopolitan
Kawealea	Japanese barracuda	Japanese, Hawaiian, Cosmopolitan
Kumu	Red goatfish	Chinese, Cosmopolitan
Laenihi (nabeta)	Razorfish	Japanese, Cosmopolitan
Mahimahi	Dolphin	Cosmopolitan
Manini	Convict tang	Hawaiian, Filipino, Cosmopolitan
Moana	Goatfish	Chinese, Cosmopolitan
Moi	Threadfish	Chinese, Japanese, Cosmopolitan
Mu	Snapper or porgy	Japanese, Filipino, Cosmopolitan
Na'ena'e	Orange spotted tang	Hawaiian, Filipino, Cosmopolitan
Nohu (hogo)	Common scorpion or rock cod or stonefish	Japanese, Cosmopolitan
Nunu	Stickfish or trumpetfish	Chinese, Filipino, Cosmopolitan
'O'io	Bonefish	Hawaiian, Chinese, Cosmopolitan
'Omaka	Jack	Japanese, Cosmopolitan
Ono	Wahoo	Cosmopolitan
'Opakapaka	Pink snapper	Japanese, Cosmopolitan
'Opelu	Mackerel scad	Hawaiian, Cosmopolitan
Palani	Surgeon fish	Hawaiian, Filipino, Cosmopolitan
Papio	Jack crevalle	Chinese, Japanese, Cosmopolitan
Pualu	Surgeon fish	Hawaiian, Filipino, Cosmopolitan
Uhu	Parrot fish	Chinese, Filipino, Cosmopolitan
Ukikiki (gindai)	Snapper	Japanese, Cosmopolitan
Uku	Grey snapper	Japanese, Cosmopolitan
'Ula'ula (ehu)	Red snapper	Japanese, Cosmopolitan
U'u (menpachi)	Squirrel fish	Japanese, Samoan, Cosmopolitan
Weke-ula	Red goatfish	Hawaiian, Japanese, Cosmopolitan

and kala. Red snapper, ahi, aku, and red weke are popular with Japanese; traditionally, red symbolizes luck and prosperity to the Japanese, and these red and red-fleshed fish are popular gift items. Preferences of various ethnic groups for different species of fish, enumerated in Table 2, were obtained by interviewing 15 fish dealers in downtown Honolulu.

Hawaiians and other Polynesians eat the widest range of fish caught in local waters, including most of the under-exploited fish species. Fish is also a popular item in most bars, tea houses, and clubs. Mahimahi is popular with Mainland tourists, while ahi is a favorite of Japanese tourists. Fish landed in large quantities and, hence, less expensive are often purchased by people of lower income.

Fish dealers reported that demand for fish was distinctly higher during holidays (Federal, State, and ethnic), weekends, and the day after pay days.

THE SUPPLIER: HAWAII'S FISHERMEN

The Hawaii fishing industry is characterized by almost no new vessel construction, not enough well-trained young fishermen, increasing fishing costs without a proportional corresponding increase in the price of fish to fishermen, small catches, and a stagnant technology. Fishermen interviewed indicate that the biggest problem is the limited amount of labor available for commercial fishing. Worse yet, there is "no more captain material," to use the terminology of the older fishermen.

Even though Hawaii's fishermen represent various ethnic backgrounds, they are predominantly of Japanese extraction. According to figures compiled by the *Nippu Jiji*, a Hawaii-state Japanese language newspaper, there were 2440 licensed fishermen in the Territory of Hawaii in 1927; of these, 1512 were noncitizens of Japanese ancestry and 928 were citizens, the majority Japanese, with the remainder Filipinos, Samoans, Okinawans, Hawaiians, Micronesians, and others. The situation today remains basically unchanged.

The industry faces a crucial shortage of trained, young crewmen. In 1964, 73 percent of the commercial fishermen were concentrated in the 36 to 65 age group and 5.2 percent were 66 years or over. Table 3 gives the age distribution of the fishermen by Island in 1964; it can be seen

Table 3. Number and age distribution of commercial fishermen by Island, State of Hawaii, 1964

Age	Island						Total	Percent
	Oahu	Hawaii	Maui	Kauai	Molokai	Lanai		
20 and under	5	6	4	0	1	1	17	2.1
21 to 25	10	12	6	2	0	0	30	3.7
26 to 30	28	12	9	3	0	0	52	6.4
31 to 35	43	14	14	5	2	1	79	9.7
36 to 40	45	22	25	4	5	0	101	12.4
41 to 45	64	24	9	8	5	3	113	13.8
46 to 50	57	26	12	8	2	4	109	13.3
51 to 55	48	23	19	8	10	3	111	13.6
56 to 60	41	16	12	5	9	1	84	10.3
61 to 65	39	18	9	6	5	6	83	10.2
66 and over	15	3	3	4	8	4	37	4.5
Total	395	176	122	53	47	23	816	
Percentage	48.4	21.6	14.9	6.5	5.8	2.8		

Source: Division of Fish and Game, Department of Land and Natural Resources, State of Hawaii. Unpublished data, 1964.

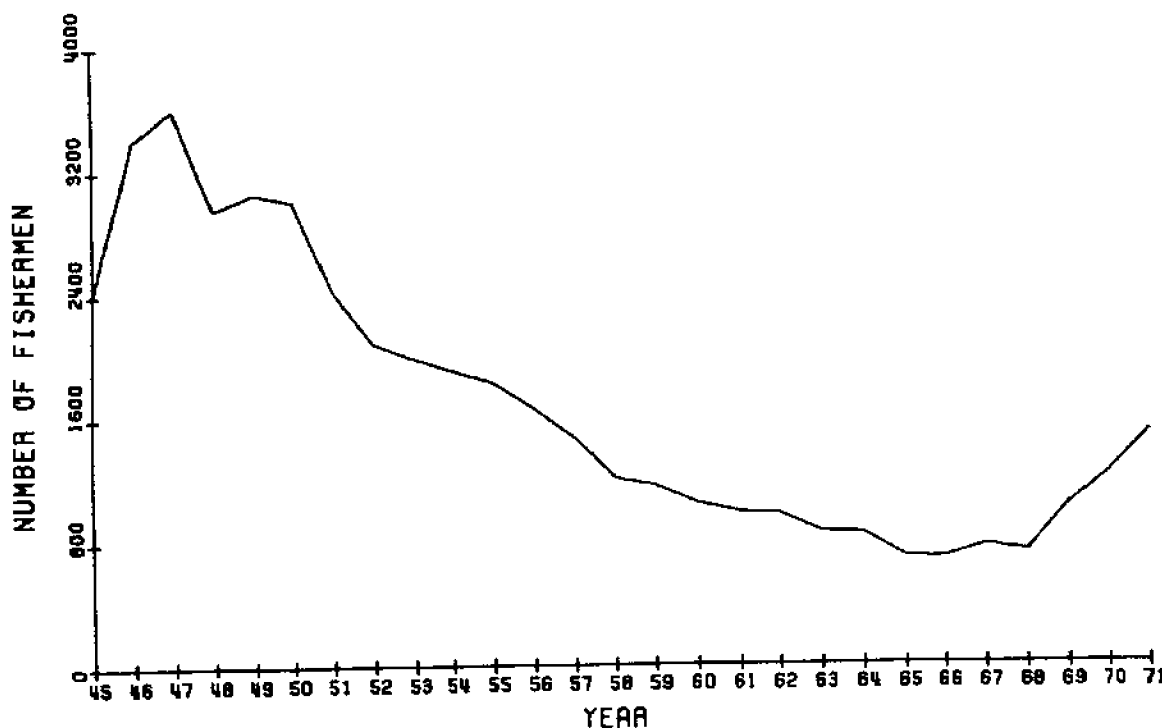


Figure 2. Number of commercial fishermen in Hawaii, 1945-1971.

that 48 percent had Oahu as their base of operations. The number of local fishermen is decreasing rapidly; from an all-time high of 3532 in 1927, the number declined to 1373 in 1971 (see Figure 2). However, it should be emphasized that the number in 1971 does not necessarily indicate the actual number of commercial fishermen; anyone who applies for a commercial fishing license (which costs \$10) is classified as a commercial fisherman. Many of these people actually fish part-time, or fish as a recreational pastime. There are considerably fewer active, full-time commercial fishermen than the number shown in Figure 2. For this reason, the upturn of the curve in 1968 is misleading.

The dwindling local supply of labor for crew members has necessitated the importation of alien labor, particularly Okinawan, to work on some of the fishing vessels, notably the aku and ahi boats.

The U.S. Coast Guard lists the Hawaii fishing fleet as being composed of 83 vessels, of which 40 are readily identifiable as to fishing technique employed (see Tables 4 and 5). The most common technique is longline fishing (50 percent of the identifiable boats), and the next most common is pole-and-line. The rest of the boats are divided between handline, trolling, and bag-and-gill netting. The typical boat is fairly old (80 percent of the identifiable fishing boats were constructed before 1950), and boat capacities are limited. The largest boat in the old fleet (boats 20 years or older) is 77 tons gross, but the average is about 30 tons gross. Since 1969, four new vessels have been constructed under the Hawaii Fisheries New Vessel Construction Loan Program.^{1/} All four are longline boats that range in size from 98 to 161 gross tons. With the exception of these new boats, the overall standard of technology is low; few boats have mechanical means of refrigeration on board or are capable of extended stays at sea. The type of

^{1/} The Hawaii Fisheries New Vessel Construction Loan Program was authorized by Act 193, Session Laws of Hawaii 1965, as amended by Act 28, Session Laws of Hawaii 1968. Its purpose is to assist in the development of commercial fishing in the State by providing financial assistance for construction of new fishing vessels capable of operating in areas of greater resource, beyond the range of the present fleet. Loans of up to 80 percent of the cost of construction are authorized at a simple interest rate of 5.5 percent per annum, with terms up to 20 years. The first new vessel was built in 1969, the first in 16 years.

Table 4. Number of fishing boats by technique employed and year constructed

Year boat was constructed	Longline	Pole-and-line	Others ^{a/}	Not classified ^{b/}	Total
Pre-1940	3	8	1	6	18
1940-1949	11	5	3	18	37
1950-1959	2	2	0	7	11
1960-1969	1	0	0	6	7
1970-1973	<u>3</u>	<u>0</u>	<u>1</u>	<u>6</u>	<u>10</u>
Total	20	15	5	43	83

a/ Includes handlines, trolls, and bag-and-gill netting.

b/ Probably includes some sport fishing boats as well as bag nets, gill nets, trolls, and handlines.

Source: U.S. Coast Guard, Hawaii. Unpublished data.

Table 5. Average number in crew by technique and year constructed

Year	Longline	Pole-and-line	Others	Total
Pre-1940	3	8.5	3	6.5
1940-1949	4	11	5.5	6
1950-1959	3.5	10.5	na ^{a/}	7.5
1960-1969	4	na	na	4
1970-1973	na	na	2	2
Average	4	10	4	6

a/ na = not available.

Source: U.S. Coast Guard, Hawaii. Unpublished data.

fishing and the type of gear used, in general, have not kept up with worldwide advances in fishing technology.

Other factors have also hampered commercial fishermen. The inshore and reef fisheries have been grossly exploited in recent years, especially by noncommercial fishermen and divers (recreational fishing). Efforts to check such destructive fishing practices as spearing, poisoning (especially the use of bleaches), and setting off explosives have been only partially successful. Productive reef areas and old Hawaii fishponds are being destroyed by landfills and runoff from real estate subdivisions, parks, and commercial structures. Some reef areas are being silted and polluted by sewage disposal and sugar mill by-products.

MARKET STRUCTURE AND PRACTICES

As early as the 19th century, the local fresh fish market was composed of numerous small operators. Dole, in his report to the Hawaiian Historical Society, gives a good account of the old fish market (2). The old market was an important institution during early commercial Hawaii. It was the nerve center of Honolulu, where impromptu mass meetings were held and political orators held forth in election campaigns, usually each on a rostrum of an overturned salmon barrel. The fish market was also a social center on weekends: on Saturdays, a half holiday, business was at its height and men and women dressed elegantly for the occasion.

Fish marketing came to a virtual halt during World War II when most of the fishermen enlisted in the armed forces and there was little fishing. Also, both production and marketing were regulated by the government during the war; even the produce market was under the supervision of the Office of Food Administration. The small produce firms were dissolved, and the Hawaii Produce Market was organized in its place. After the war, when government supervision was halted, the market structure reverted to its original form of separate, small business units, and the basic supplier-wholesaler-retailer relationship reappeared. In the immediate post-war years, there were about six fish dealers and 74 fish peddlers. Fish peddling was an important market institution, capturing a sizable market share.

In the post-war years, fishing was an attractive profession; an average fisherman earned as much as \$30 or \$40 a week, compared with an \$18-a-month average for a plantation laborer (8).

The Hawaii commercial fishing industry is fragmented, composed primarily of many small and a few large firms, each varying in the form of its legal and organizational structure. In 1967, the 15 firms in the wholesale trade consisted of 13 merchant wholesalers and two broker-merchandizers, with aggregate sales of \$9,630,000, or an average sale of \$642,000. The range of sales for individual firms was not available. In 1971, there were 10 wholesalers: 4 firms with 1 to 3 employees, 1 wholesaler with 4 to 7 employees, 3 with 8 to 19 employees, and 2 with 20 to 49 employees (3). Of the 35 firms handling fish, 12 were corporations, 18 were single proprietorships, and 5 were partnerships.

In terms of organizational structure, these firms are separate business entities. There is little evidence of integration or any kind of organizational expansion or combination. However, cooperation between or among wholesalers and retailers is not rare. An example is the procurement arrangement firms often utilize when importing fish from Mainland or foreign sources--that is, importing large quantities jointly to obtain cheaper freight and quantity discounts. This procurement understanding is mutually beneficial. Except for these loose informal arrangements, however, no firm contracts bind the fish dealers together. Also, no formal contracts binding fishermen to wholesalers or wholesalers to retailers were found, except for similar kinds of loose, informal arrangements. However, there are some fish wholesalers who have integrated upward into retailing, and there are some fish retailers who have integrated downward into wholesaling. At the completion of this study, there were two fish dealers who were integrated all the way from fisherman to retail level.

In 1967, there were 30 retail firms (with payroll) with an aggregate sales of \$2,605,000, implying average sales of about \$86,800. In 1971, there were 37 firms, composed of 23 firms with 1 to 3 employees, 11 with 4 to 7 employees, 2 with 8 to 19 employees, and 1 firm with 20 to 49 employees. This is exclusive of the 15 fish peddlers, who also handled a sizable volume. The most common organizational and legal structure among the retailers is the single proprietorship-family type operation. Again, these firms are operated independently and separately. There is no evidence of integration.

All the wholesalers and most of the retailers are located in Honolulu. The rest are scattered in the outskirts of the metropolitan area and on the Neighbor Islands. Within Honolulu, the firms are found in six principal locations: the Oahu Market, the Market Place (Aala Market), the C.Q. Yee Hop Building, the Ala Moana Farmers Market, the Holau Market, and the Queen River Market. Four wholesalers are housed in the Market Place, and concentrations of retailers are found in the Ala Moana Farmers Market with 4, the Oahu Market with 7, the Holau Market with 3, the C.Q. Yee Hop Building with 4, and the Queen River Market with 2. The remainder are scattered throughout the city.

History of Hawaii's Fish Auction

Before World War II, there were three fishing companies in Honolulu and one small company in Hilo. The auction companies in Honolulu were the Hawaii Suisan Kaisha, Honolulu Fishing Company, and the Pacific Fishing Company. The Hawaii Suisan Kaisha was the largest; incorporated in January 1923, it was the successor of Hawaii Fisheries, which had been operating for more than 20 years. This concern alone handled about \$500,000 worth of fish from 130 boats annually. The next largest auction was the Pacific Fishing Company, incorporated on May 10, 1910. This auction served 60 boats. The Honolulu Fishing Company, incorporated on November 2, 1914, sold fish from 40 boats worth about \$185,000 per year.

These auctions charged 10 percent commission on the gross receipts of the boats for services rendered, including transportation (pickups and deliveries), auctioning, distributing, and financing. The auctions helped in registering the boats and in processing wharfage fees for the fishermen. The auctions also helped organize search parties in case of mishap.

The Kyodo Fishing Company (now the United Fishing Agency) was established after World War II as a fish auction. It utilized the facilities owned by M. Otani Company Limited. For several years it was the only fish auction on Oahu and, as a result, it was alleged to be an auction monopoly (6). Subsequently, a bill was introduced in the 1951 session of the State legislature, attempting to abolish the single auction by authorizing a fishermen cooperative. The bill, however, did not survive in the senate committee. The "monopoly" ended with the establishment of another auction, King Fishing Company Limited, in 1951 (7). The two-auction structures ended in 1968 when the second auction went out of business.

Practices in Hawaii's Fish Auction

Auctioning is typical of fish marketing worldwide and is an integral part of the economics of fish marketing. An auction is a complex mechanism that is not easily interpreted by the uninitiated. Since fish are highly variable in quality and quantity, auctioning is one of the more suitable channels of distribution because it allows both display of fish for inspection and selection by potential buyers and permits the formation of price differentials based on quality, species, quantity, and size. The auction method of selling and price-making facilitates the rapid movement of heterogeneous products. To date, there has been no satisfactory grading system developed for fish. Grading according to size and species is the only generally accepted method; all other grading criteria utilized are subjective and based on individual judgments of market participants. Nevertheless, according to one industry source, if, after a transaction is completed, the fish is found to be of poor quality, partial compensation is possible. Generally, the buyer contacts the fisherman who supplied the fish and the concerned fisherman brings the buyer additional fish without charge the next time he brings fish to the market.

The most important role of the fish auction is price-making, serving as a "barometer" of current business conditions. The price of fish, especially for the fresh fish market, is dependent on conditions of supply and demand. Fish supply is so uncertain (especially in Hawaii) that any price-making depends on expected demand. The actual sale of fish is a day-to-day process, closely related to the price structure originating at the daily fish auction.

The auction is attended by buyers and nonbuyers. The purpose of the nonbuyer fish dealer is to observe and gather information on prices, quantity of fish available for that day, and the general price-making mechanism of the auction market.

Today, the principal outlet for fresh fish in Hawaii is through the remaining fish auction on Oahu, held every day except Sundays and holidays. It starts at 6:30 a.m. for the "big fish"--ahi, aku, mahimahi, marlin, and swordfish, for example. At 7:30 a.m., the "small fish" auction, for example, menpachi, kumu, and weke, begins.

The fish are transported from the wharves, where the boats are moored, to the auction floor. They are arranged on wooden planks, ordered according to the arrival of the boats in port. The first boat to come in will have its fish auctioned first. The fish are arranged on the planks according to size, the biggest fish first. They are not allowed on the concrete floor because it is believed that contact with concrete causes deterioration. The smaller fish are placed in tubs. After the fish are lined up, the auctioneer rings a brass bell to summon the fish dealers, and bidding begins.

Once the fish are sold, they are trucked or hand-carted to the respective buyers. Payment by the dealers is made on a regular monthly basis, and it is the responsibility of the auction to make the collections. The fishermen are generally paid by the auction company immediately after the fish are sold.

The fish are purchased by wholesalers, retailers, and peddlers, the bulk being bought by wholesalers. The wholesalers, in turn, sell to retailers and peddlers. There are 17 wholesalers: six are strictly wholesalers, seven do 50 percent wholesaling and 50 percent retailing, and the rest do limited retailing. These wholesalers deliver to restaurants, bars, cafes, teahouses, hotels, and chain stores; three send fish to the Mainland. There are 22 fish retailers: 12 do strictly retail business, with the rest also doing some wholesaling. Generally, no credit is extended to the customers; this is especially true at the retail level. However, at the wholesale level, limited credit is available.

Licensed fish peddling is an important link in the distribution system. Fish peddlers travel throughout Honolulu and rural areas in automobiles, modified vans, or pickup trucks, to sell fish and other food items, such as red meat and vegetables. There are presently about 15 fish peddlers; there were, however, as many as 75 during the pre-supermarket era. These fish peddlers usually procure their fish from wholesalers or retailers. Industry sources report that peddlers are generally unable to bid at the auction; if given a chance, the prices are artificially forced very

Table 6. Selected phrases, counters, and words used at the fish auction in Hawaii

Phrases, counters, and words	Meaning
Fifty whore house	\$0.54 1/2
Japanese dog (won, won, won)	\$1.11
Haole dog	\$1.25
Portuguese dog	\$1.30
Charter the boat	\$0.75
Poi kau kau	\$0.55
Ichi maru maru (one zero zero)	\$1.00
Pun <u>or</u> humble	Half cent
Ikinée	All the fish for the same price
Ichi <u>or</u> ich	One
All straight up	Eleven
Ariya	Fifteen

high in the bidding process. Hence, peddlers must depend on the wholesalers; in addition, they do not get the better fish, sometimes even salvaging shark-bitten fish.

The fish auctions in both Honolulu and Hilo are minor tourist attractions as well as market outlets for fish. Observers enjoy the auction process and the display of various kinds of fish. If one understands the language used for bids and cues, it is even more interesting. Altogether, there are 7 "big fish" dealers and 20 "small fish" dealers who regularly attend. (Some "big fish" dealers also bid for "small fish.") Once the bidding begins, activities revolve around these dealers and the auctioneer.

A mixture of languages is used in the bidding process, but it is conducted principally in English. Bidding starts when the auctioneer calls out the type of fish and its weight. Bidding ascends with a minimum change of one-half cent. The bidders commonly use nonverbal cues, such as shrugging the shoulders, raising the eyebrows, winking the eye, twitching the mouth, raising the thumb, raising the open palm above the waistline, and standing on tip-toes. Basically, all these nonverbal cues indicate a one-half cent increase over the last bid. Other cues have more definite meanings. Two fingers extended palm up tells the auctioneer to raise the bid by 2 cents, while two fingers extended palm down indicates an increase in the bid by 10 cents plus an amount that makes the bid divisible by 10. (For example, if the last bid was 54.5 cents, the next bid would be 70 cents.) Five fingers extended palm up means to move to the next bid divisible by five.

The local fish auction reflects the ethnic and social background of the dealer participants. In addition to English and Japanese, words, counters, and even phrases from Chinese, Hawaiian, and Portuguese are frequently used (see Table 6). In addition, invented counters are used which are unique to this particular auction. Several of these latter counters are restricted to the early auction because of the presence of female fish dealers at the later (small fish) auction.

Financial Structure of the Auction

The United Fishing Agency is the only fish auction presently operating on Oahu. It was founded by a group of local Japanese wholesalers, retailers, and fishing-boat owners. The auction is housed in the Market Place (Aala Market) and is owned by M. Otani, the largest fish dealer in town. The rent for the auction space is based on 1 percent of the day's earnings. The United Fishing Agency is owned by 25 stockholders. Fifty percent of the ownership is held by wholesalers, the remainder being divided among fishing-boat owners and employees of the auction. The managerial group and board of directors are both dominated by wholesalers and fish processors (4).

Besides performing the service of auctioning, the United Fishing Agency also provides such services as collecting fish from the pier, preparing big fish for inspection by dealers (done by cutting a wedge at the tail end, thus exposing the flesh for inspection), beheading and gutting

the big fish, and delivering to various dealers within the metropolitan area. In addition, the auction house furnishes bookkeeping and accounting services for the boat operators. The United Fishing Agency also provides limited loans for fishermen, helping to finance boat repair, boat maintenance, and new boat construction. It also keeps fishermen and fish dealers informed on the latest developments directly affecting them, such as State and Federal programs and policy.

For services rendered, the auction charges 10 percent of the boat's gross earnings and one-half cent per pound for the collection of the fish, the use of containers, and bookkeeping. Peterson (11) estimates that the charges come to about 11 to 12.5 percent of the catch's gross receipts.

Volume of Business

Different fish dealers have different sources of supply. Some depend mainly on the auction; others depend on their own network of fishermen who supply them on a regular basis. Still others depend on family members who fish. Some dealers may depend on other dealers who have surplus fish; these fellow dealer-suppliers generally charge about 5 cents more than their purchase price per pound.

The principal supply of fresh fish is on Oahu, although some are flown in from the Neighbor Islands--generally, whenever there is a surplus there. In 1972, the Oahu catch accounted for 12,465,000 pounds, valued at \$4,782,000; this represented 84 percent of the total fish supply to the State. Some chilled fresh fish are flown in from the Mainland and foreign sources. In 1968, there were 592 fishermen of all types on Oahu supplying the fresh fish market: there were 171 fishermen on Hawaii, 25 on Molokai, 72 on Kauai, 149 on Maui, and 16 on Lanai. Fishermen, as described here, refer to fishermen employing all types of gear, including haul seines, big nets, pots and traps, gill nets, handlines, pole-and-lines, trolls, longlines, lift nets, cast nets, and spears.

In 1971, 11,824,000 pounds of fresh or frozen fish valued at \$4 million were imported to Hawaii. There were also substantial imports of fishcake, salt, and dried fish. In 1972, twice as much fresh and frozen fish were imported (see Table 7).

Just as the landings of fish (supply) are unpredictable, the daily volume of business is difficult to predict. However, the average volume of sales can be estimated for both small-fish and big-fish dealers. On an average day, a typical small-fish dealer could sell 35 pounds of hooked akule, 100 pounds of netted akule, 40 pounds of goatfish, and 70 to 100 pounds of red, grey, or pink snapper, sea bass, or amberjack. In addition, about 35 pounds of other reef fish, such as manini, opelu, aholehole, aweoweo, kumu, mamu, u'u, and weke ula, could be sold.

All fish dealers report that sales are high during the weekends and slow on weekdays. Sales are also higher on pay days and holidays.

The smaller firms account for about 20 to 25 percent of the sales of tuna species and 65 to 70 percent of reef and deep-sea fish sales. The remaining sales are completed by the few large firms.

Table 7. Imports of fresh and frozen fish to Hawaii

Type	1971		1972	
	Amount (lb.)	Value	Amount (lb.)	Value
Albacore	6,980,000	\$2,465,000	12,026,000	\$5,199,000
Yellowfin tuna	3,217,000	1,113,000	5,695,000	2,157,000
Skipjack tuna	63,000	27,000	1,500,000	377,000
Other fish	1,564,000	457,000	1,522,000	588,000
Total	11,824,000	\$4,062,000	20,743,000	\$8,301,000

Source: United States General Imports and Imports for Consumption, 1971-1972. U.S. Department of Commerce, Bureau of the Census, 1973.

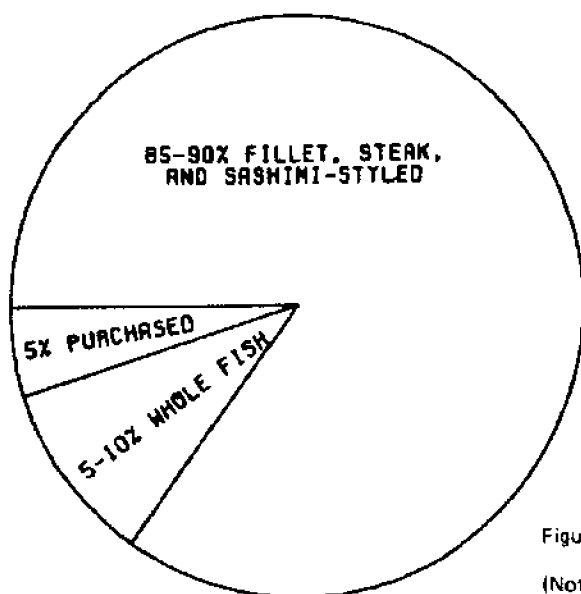


Figure 3. Relative importance of different product forms of aku.

(Note: Prepared fish include poki, shoyu aku, and so on.)

The Fish Dealers

The fish market in Hawaii is an open air market, and the fish offered for sale are displayed on counters. The fish stalls are rented or leased, and the average rent is about \$300 per month. There are generally 28 to 30 fish dealers in the market; about 71 percent are of Japanese ancestry, 14 percent Chinese, 11 percent Hawaiian, and 4 percent Caucasian. Present participants report that in the past there were more Chinese than Japanese dealers. Most of the fish dealers are old-timers who have been in the business for at least 30 years.

The retail fish business in Hawaii is composed of small fish stalls that are family operated with a minimum of hired help. The prewar pattern of retailing has persisted to this day; however, the business volume has been affected to a certain extent by supermarkets, which were introduced to the islands in the late 1940s.

There are 10 dealers who do only retail business, and 11 who do retail and some wholesale. These retailers obtain their supplies from the auction, from wholesalers, and directly from fishermen. The principal services they provide are cleaning and preparation of the fish for sale (scaling, gutting, beheading, cutting into thin slices for sashimi, and so on).

The success of these dealers has been largely a function of their ability to maintain good relations with their customers. In fact, many retailers maintain a stable or established clientele due either to the ability of the customers to relate to them for reasons of ethnic background or to the types of fish they carry.

Product forms vary among fish species. Larger fish, such as the ahi species (yellowfin and bigeye tuna), aku, marlin, and sea bass, are often cut into smaller portions, such as fillets, steaks, and sashimi-styled cuts. The smaller of these species are generally marketed whole. The smaller reef fish, such as akule, halahu, opelu, weke, mampachi, manini, snapper varieties, and goatfish, are also sold whole.

The relative importance of different product forms of various fish species is difficult to estimate. Figure 3 illustrates the best--but it is necessarily a rough approximation of the relative importance of the different product forms of fish retailed. The filleted form and sashimi-styled cuts are the most important product forms for the tuna varieties (ahi and aku), while the steaked form is important for sea bass and the larger snappers.

Marketing Channels

The main source of fresh fish in Hawaii is local waters, although chilled fresh fish are flown in from the outside, notably the Pacific Northwest, Australia, and New Zealand. In the process of getting the fish from ocean to consumer, the fish pass from one owner to another through a network of distribution channels, from the place of landing to the point of final consumption.

Different stages include the primary material market (processors to tuna packers), intermediate markets (wholesalers), and final markets (retailers). Intermediaries, either directly or indirectly, perform services including transportation (pickup and delivery), auctioning, wholesaling, retailing, financing, storing, and processing.

Different species of fish are carried by different categories of outlets. The fish retailers in downtown Honolulu carry the widest variety. Supermarkets and grocery stores ("mom-and-pop" stores included) normally carry aku, small ahi, mullet, akule, halalu, opelu, weke, filleted and steaked forms of sea bass, and snapper varieties. The most common product forms in supermarkets and some grocery stores are the filleted and steaked forms; some whole fish, however, are sold through these institutions. The clientele of grocery stores consists mainly of Caucasians and some Orientals who prefer convenience. In self-service supermarkets, fish, either whole or filleted, are sold wrapped on styrofoam trays. In some supermarket chains, cleaning (scaling and gutting) services are not provided. The prices in these stores are higher than prices in the open air market, even without such added services as cleaning or cutting into thin slices for sashimi. In the isolated situation of a chain or grocery store, it is difficult to compare prices, while in the open air market, where fish stalls are in one location, customers can readily compare.

The fish caught are distributed at several points. From the landings, the fish are distributed in at least four different ways:

1. Through the fish auction;
2. Through direct sales to wholesalers and retailers;
3. Through peddling by fish peddlers and fishermen themselves;
4. Through processors (tuna fish only).

Fish is a "common property resource," freely available and exploited without payment for its use, except for harvesting costs. Fish harvesting is an "extractive" activity, and the amount of catch is subject to wide variations. Depending on the quantity of fish landed, the amount that flows through various market channels is contingent on expected prices in the channels, types of fish landed, prearranged agreements with wholesalers and retailers, time of the year, and ownership of the fishing vessels.

Besides the fish landed on Oahu, there is a significant quantity air-freighted from the Neighbor Islands. These fish either go through the auction or go directly to the wholesalers or retailers. In Honolulu there are two fish dealers whose supply comes solely from the Islands of Hawaii and Kauai.

In addition to the various official channels of distribution, there is a significant flow of fish through illegal channels. Several dealers believe that the volume of fish handled by unlicensed fish peddlers is sufficiently large to affect their sales. These illegal peddlers procure their fish from friends, from unlicensed fishermen, from boat captains (in exchange for work), and by other means. The illegal peddlers should not be confused with peddling by commercial

Table 8. Total commercial fish landings by Island, 1972

Island	Weight (lb.)	Value
Hawaii	1,173,240	\$ 589,544
Maui	781,976	227,504
Lanai	10,418	5,340
Molokai	21,052	12,010
Oahu	12,454,200	4,776,063
Kauai	313,788	128,909
Total	14,754,674	\$5,739,370

Source: Division of Fish and Game,
Department of Land and Natural
Resources, State of Hawaii.
Unpublished data, 1972.

Table 9. Total commercial fish catch by species, 1972

Species	Weight (lb.)	Value
Aku (skipjack tuna)	10,917,378	\$2,949,372
'Ahi (yellowfin tuna)	825,854	560,357
'Ahi (bigeye tuna)	504,045	683,843
Akule (bigeye scad)	542,140	231,126
Other species	<u>1,983,257</u>	<u>1,314,672</u>
Total	14,772,674	\$5,739,370

Source: Division of Fish and Game, Department of Land and Natural Resources, State of Hawaii.
Unpublished data, 1972.

fishermen, sports fishermen, or licensed peddlers; if a person is licensed to fish, he is also allowed to sell his fish.

Fish are landed on all the major Hawaiian Islands (see Table 8), but Oahu is by far the most important, accounting for 84 percent of the total State's landings. The Island of Hawaii accounts for 8 percent of the total landing, and the combined landings of Maui, Lanai, Molokai, and Kauai constitute the remaining 8 percent of the total catch. Aku is the most important fish species harvested (Table 9), accounting for 74 percent of the total tonnage and 50 percent of the total value.

On Oahu, fish are landed at more than 21 different points. Kewalo Basin is the most important, accounting for about 95 percent. Most of the fish landed at Kewalo Basin are tunas (ahi and aku), marlin, and swordfish. Other landing points include Pier 15, Koko Head, Maunaloa Bay, Diamond Head, Sand Island, Kalihi, Waipahu, Ewa Beach, Nanakuli, Waianae, Pokai Bay, Wailua, Haleiwa, Waimea Bay, Kahului, Laie, Punaluu, and Kaneohe Bay.

In any commodity market, there generally exists more than one distribution channel. The potential contact points for economic exchange in the fish marketing system in Hawaii include 1400 fishermen, 1 auction, 28 to 30 fish dealers (wholesale and retail), 4 fishcake factories, a fish cannery, several small fish processors, numerous supermarket chains, small retail stores, and, finally, the residents who consume fish. Due to lack of data, it was not possible to define the exact market channels for all fish. Detailed data on the demand of supermarkets, restaurants, the zoo, and oceanic laboratories utilizing fish are not readily available; nevertheless, some generalizations can be made about the importance of these outlets. There are at least five supermarket chains handling fish in Hawaii, one of which has 18 stores. Numerous restaurants also serve fish.

There are also significant, not easily measured, quantities of fish entering the market, including fish landed by pleasure boats and by noncommercial fishermen. Some fish landed by pleasure boats are sold through the auction, some are brought to wholesalers or retailers directly, and some are peddled in residential areas or in the vicinity of government offices by enterprising fishermen. Spear fishing is illegal if the catch is meant for sale. Speared fish may legally be used for home consumption, but a significant amount are sold to Chinese chop sui restaurants, and a small amount finds its way to counters of local fish stalls. The stall owner, however, risks being cited for selling illegally caught fish.

Although it is difficult to trace the actual percentage of fish flowing through different market channels, it is possible to identify the predominant fish marketing channels (see Figure 4). The four principal channels, in order of decreasing volume, are:

1. Commercial Fishermen--Auction--Wholesalers--Retailers--Ultimate Consumers.
2. Commercial Fishermen--Wholesalers--Retailers--Ultimate Consumers.
3. Commercial Fishermen--Peddlers (or Retailers)--Ultimate Consumers.
4. Commercial Fishermen--Ultimate Consumers.

In 1972, aku landings totaled 10,917,000 pounds. Aku are marketed through one of three channels. About 10,000 pounds can be absorbed daily by the fresh fish market, or an annual total

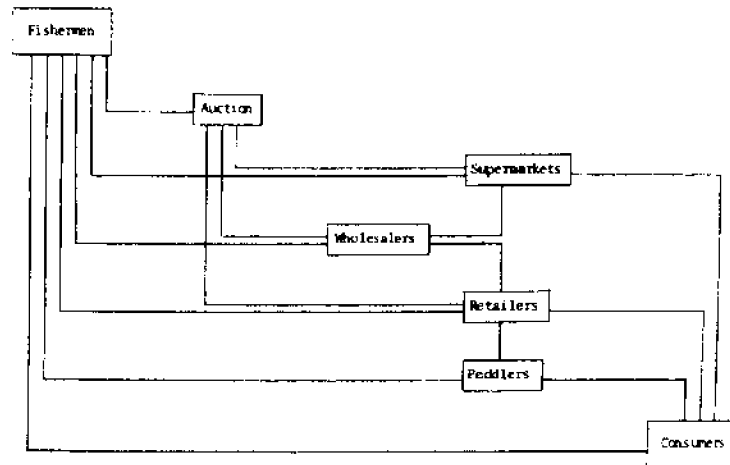


Figure 4. Distribution channels for fresh fish.

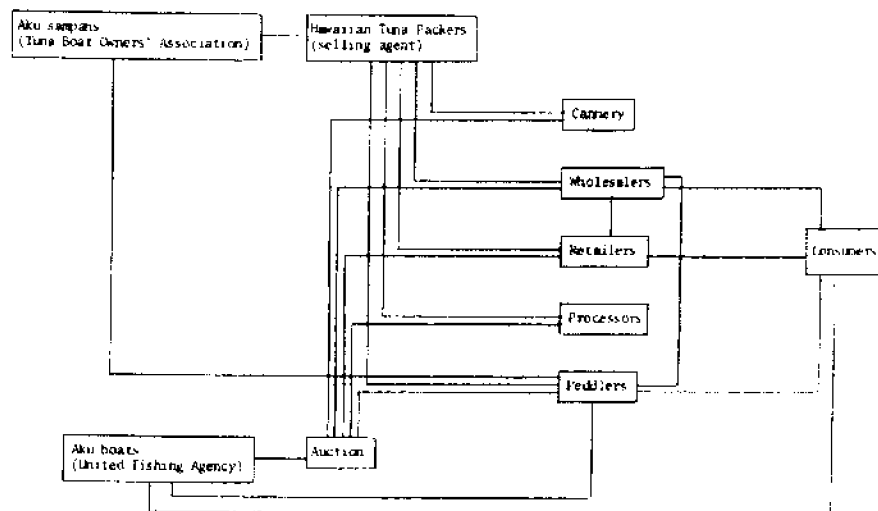


Figure 5. Distribution channels for fresh aku.

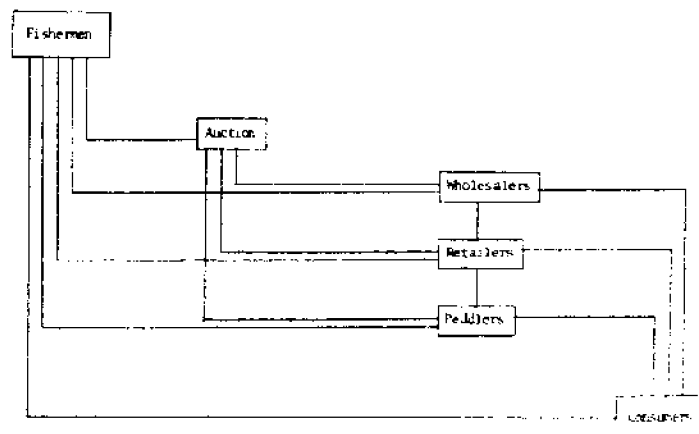


Figure 6. Distribution channels for fresh ahi.

of 3.65 million pounds. This corresponds to about 33 percent of the total aku catch in 1972. The remainder (7,267,000 pounds) was sold to the cannery in Honolulu. A small, undetermined amount of aku was sold to salted-aku manufacturers.

Figure 5 illustrates the market channels for aku. About one-quarter of the 33 percent that passed through the fresh fish market was distributed through the auction, sold mainly by the Hawaiian Tuna Packers, representing the Tuna Boat Owners' Association with 10 member boats and the United Fishing Agency (the auction), affiliated with three aku boats. The auction handles all aku from these three vessels. Since there are only two marketing agencies representing the aku fishermen, the two sellers can potentially influence the price level. During the winter months when the aku supply is low, all are sold to the fresh fish market and bring a higher price than paid by the cannery.

Almost all the ahi landed in Kewalo Basin and Pier 15 are distributed through the auction. About 1,348,000 pounds of ahi tuna were landed during 1972, composed of 823,000 pounds of yellowfin tuna, 18,000 pounds of albacore, and 504,000 pounds of bigeye tuna. It is estimated that almost 90 percent of the ahi passes through the auction, while the remainder moves directly from the fishermen to peddlers, wholesalers, or retailers (see Figure 6).

In 1972, 241,000 pounds of akule were landed on Oahu. Of this, about 70 percent was landed at either Kewalo Basin or Pier 15 and was marketed via the auction. (These figures exclude the akule retained by fishermen for home consumption. The amount of unmarketed akule is estimated to be between 5000 to 7000 pounds annually.) The remaining 30 percent of the total Oahu akule catch was distributed and marketed in the vicinity of the other landing points (such as Haleiwa, Kaneohe, Pokai Bay, Ala Wai, Waianae, and Keehi Lagoon).

Structural Aspects of the Fish Market

A basic premise in analyses of market structures is that certain structures are conducive to less than optimal market performance in a social sense. This premise was derived from historical facts that associated low performance norms with the existence of certain structures (for example, high prices and the resulting misallocation of resources have been associated with monopolies). It must be emphasized, however, that analysis of market structures alone cannot prove the existence of less than optimal performance; the analysis can only indicate whether or not the market in question possesses certain attributes that may be conducive to misconduct, high prices, low efficiency, poor product quality, and a general low standard of performance.

Three of the most important structural attributes of a market for a commodity such as fish are:

1. Ease of entry into the market;
2. Degree of buyer and seller concentration;
3. Absolute number of firms.

All factors that affect the ease with which a firm can enter a market or industry are barriers to entry. The existence of barriers to entry directly implies that existing firms have a competitive advantage over potential entrants. Some forms of entry barriers relevant to this study are the costs or financial advantages that may accrue to established firms, the accumulated patronage and goodwill of established firms, the existence of economies of scale, and the existence (or nonexistence) of social and institutional barriers.

One obvious symptom of the existence of a significant entry barrier is a static market, that is, a market whose participants are stable or fixed over a period of time. After examining Oahu retailers and wholesalers listed in the telephone book who specialize in fish and who collectively form a large portion of the market for food fish, it was found that the number has been nearly constant for the past eight years: the number of retailers varied between 25 and 27, and the number of wholesalers between 13 and 17. The rate of failure and addition of new firms was nearly the same for both wholesalers and retailers, that is, about 6 percent per year. As would be expected, a significant portion of the failures were new entrants into the market. Slightly more than half the new entrants into retailing lasted over a year, and slightly more than half the new entrants into wholesaling lasted more than two years.

The low attrition rate of established firms and the high mortality rate for new firms suggests the existence of barriers to entry. For example, it would be true that a well-established market adequately serves its users, provided that customer relations are an important feature of the market. In fish marketing, the accumulated goodwill and knowledge possessed by established firms can make it particularly difficult for new firms to compete. It is difficult for new entrants to obtain regular sources of supply outside the auction, and large established firms may have a competitive advantage at the auction. Industry sources say it is difficult for new

entrants to acquire quantities of fish, much less sufficient quantities to make an operation economically profitable. A new entrant will need large amounts of capital to compete effectively with the large established dealers, especially as established dealers may be prepared to take a loss in order to discourage new competition.

Fish dealers traditionally make standing arrangements to buy from fishermen on a regular basis, irrespective of prices and quantities. Some wholesalers may have as many as four or five fishermen suppliers; Peterson (11) reports that some relationships and understandings between fishermen and fish dealers have been established for as long as 11 years. These procurement arrangements consequently reduce the likelihood of a potential entrant being able to assure himself of a sufficient supply to start his business, unless he does his own fishing or can find new fishermen who are willing to supply him.

Control of superior distribution or marketing technologies is another example of a potential advantage. However, existing firms in the fish market do not possess this advantage since the very nature of the business does not facilitate the development and control of sophisticated methods of distribution or marketing. Also, there is no evidence that present techniques employed in the trade, management know-how, or equipment are more available to established firms than to potential firms. Another possible barrier to entry in the Hawaii fish market is the accumulated patronage and preferences of customers, the firm's reputation, and the types of fish carried to service the buyers' needs.

Furthermore, entry into the local fish market may be affected by the presence of social barriers. Many dealers have social and economic ties; there is also an implicit expected behavior pattern. According to one industry source, failure to conform or adhere to this expected behavior norm will result in the indirect punishment of the deviate. Thus a new entrant, besides facing other constraints, has to learn to cope with the social barrier and to depend on the goodwill of the established dealers.

Concentration, as defined by economists, refers to the control of a large proportion of some aggregate of economic activity or resources by a small number of firms. Concentration, or the size distribution of firms, is an important dimension in the analysis of market structure because it indicates the potential nature of competition, conduct, and performance for the industry. Briefly, if there is a high degree of seller concentration, effective competition is likely to be reduced. The same can be said of buyer concentration. The concentration of firms is generally considered an index of the power relationships among firms; the more concentrated the market or industry, the fewer and bigger firms there are and the more market power they wield.

A common measure for the degree of seller (buyer) concentration is an index based on the percentage share of the largest four or eight firms in the market. The concentration index reflects the structure of the market, whether it is atomistic, monopolistic, or oligopolistic.

The concentration index for fresh fish marketing in Hawaii was estimated at the wholesale level utilizing two sources of data: county business patterns (13) and surveys conducted as a part of this study.

In 1973, the largest 4 of the 13 wholesalers employed nearly 55 percent of the labor employed in fish wholesaling. Given the small number of wholesalers, such an index does not indicate a concentrated market, especially since the number of employees is at best a poor proxy for the market share of the firm.

The small number of firms, however, suggests that the phenomenon associated with a highly concentrated market could well exist in the fish wholesale sector. For example, the largest seven wholesalers employed 90 percent of the total number of employees in fish wholesaling. This may imply the presence of market leadership (price leadership and control of sources of supply) in the fish market. It seems natural for these firms to wield a great amount of market power. It may not even be surprising for them to seek to collude with other dealers.

The wholesale fish market can be described as an oligopolistic and oligopsonistic market. Oligopolistic means the seller concentration is high, that is, the number of sellers is small and each of the sellers among the few suppliers has a large share of the market. There appears to be a certain amount of mutual interdependence among the sellers, and they may collectively attempt to control the market. This suggestion is plausible because of their low number. The wholesale fish market is also oligopsonistic because the wholesalers as a group are concentrated; they purchase their fish from a greater number of small fishermen. Here again, they may seek to collude in procuring their supplies of fish.

Price Determination

Fish dealers, in determining their selling price, have to consider such factors as the rate of conversion of whole fish to salable fish (the quantity of fish recovered after gutting,

beheading, scaling, and removing the fins and tails). The rate of conversion varies with size--from about 50 to 55 percent for large fish, about 40 percent for medium fish, and about 30 to 35 percent for small fish. The fish dealers also have to consider such factors as risk, operating costs (rent, ice, wages, and paper), the perishability (loss) of the fish, and a return of their investment.

The majority of the fish dealers stated that they set their prices according to the prices obtained at the morning fish auction and by observing their competitors' prices. Fish dealers usually walk around the market area before business starts and engage other dealers in conversation on a variety of subjects, among them, the selling prices of fish. Occasionally, they telephone each other before business begins to ask about prices. Besides prices, they also try to determine the supply or availability of fish for the day. Often transactions take place between dealers, since fish dealers are also sources of supply. A fish dealer sometimes has surplus fish on hand for the day since he may be obliged to purchase the entire catch of certain fishermen. In such an event, the dealer may try to sell some to his competitors. Conversely, if a fish dealer does not have sufficient quantities of fish, he may try to obtain some from his competitors.

There are at least two fish retailers who fix their prices 10 to 15 cents below the prevailing retail market price for the same species of fish on the same day. Their rationale is that they obtain their fish directly from family members who fish or from fishermen and seldom, if ever, buy from the auction. However, fish prices are generally (wholesale or retail) a function of the auction prices. Services performed also affect the determination of the selling price. As an illustration, aku may be sold for \$0.50 a pound when uncleaned, or for \$1.25 a pound when cleaned and gutted.

The number of distribution or trade levels the fish pass through also influences the price since some services are added at each level of the market channel, and the species of fish is a crucial factor in price determination. As previously discussed, the availability of fish, ethnic holidays, and ethnic preference for certain species all affect the demand and thus the price of fish.

Traditionally, prices at the retail level were negotiated and the practice has persisted until today. Also, a majority of the dealers and the customers of these outlets originate from cultures where negotiated prices are a way of life. The dealers encourage bargaining to a certain extent. This is especially true toward the evening when the fish stalls are about to close and the dealers are trying to dispose of the unsold or excess fish and avoid the problems and costs involved in storing the fish properly.

However, bargaining at the wholesale level was not observed. There appears to be a fairly uniform price among the different wholesalers. Buyers (usually restaurants, chain stores, and retailers) contact the wholesalers early in the morning to ask for quotations on fish prices and arrange for the day's purchases. The arrangement between wholesalers and their customers appears to be well established and relatively stable; that is, the same purchasers usually appear to deal with the same wholesalers.

Due to the perishable nature of the product, dealers try to maximize sales from their freshly procured fish during the first part of the day while the fish are fresh. After the morning sales, the dealers start to sell the fish for less. Sometimes the prices differ by as much as 10 to 20 cents per pound.

Before World War II, the price received by fishermen for aku was about 4 cents a pound. With the outbreak of the war, fish landings were curtailed and prices for aku reached 28 cents a pound. In 1949, the average price was 14 cents a pound, the cannery price was 12 cents, and the fresh fish market price was 16 cents. Over the years, Hawaii fishermen have been trying to negotiate for fair prices for their catches. To date, only the aku fishermen have been successful. Aku tuna is the only fish that enjoys minimum pricing irrespective of supply; that is, aku prices are agreed upon by both the fishermen and the buyers and are not determined at the auction. However, the auction does handle aku. The fish auction has three aku sampans affiliated with it. The Hawaiian Tuna Packers is the marketing agent for boats belonging to the Tuna Boat Owners' Association. The fish dealers who handle aku maintain standing orders with either the auction or the Hawaiian Tuna Packers. The aku are delivered to dealers early in the morning between 3:00 and 4:00 a.m.

The realization of minimum pricing for aku was made possible after years of negotiation by the Tuna Boat Owners' Association and the cannery, which is the principal outlet. Minimum pricing is also followed in the fresh fish market. Daily sales of aku in the fresh fish market typically fluctuate between 5 and 10 tons and are equally divided among the aku boats that caught aku that day. The benefits of close cooperation among the aku fishermen serve as a possible example for other fishermen; however, it must be noted that the quantity of aku demanded (5 to 10 tons per day) was one of the principal reasons the Tuna Boat Owners' Association was able to bypass the auction. It is logistically difficult to auction off a volume of fish that large under the present system.

The minimum price for aku is set according to sizes and market outlets. The price range of aku in the fresh fish market was between \$0.40 and \$1.00 per pound at the time of this study. The

cannery price for aku was low, averaging about 19 cents a pound. The minimum cannery price range for aku in 1972 was estimated as:

<u>Size of aku</u>	<u>Minimum price per pound</u>
Less than 3 pounds	Not accepted
3 to 4 pounds	6.5 cents
4 to 8 pounds	11 cents
8 to 15 pounds	12 cents
More than 15 pounds	14 cents

The aku used for drying into salt fish were sold for about 35 cents per pound. The wholesale price of aku fluctuates according to the conditions of supply and demand: the highest wholesale price recorded for aku during the study was \$1.25 per pound; but the retail price was fairly stable at about \$2.00 per pound, plus or minus 10 to 20 cents.

Economic theory defines a competitive market as one where neither the individual buyer nor seller can influence the price of the product. This theoretical norm is seldom encountered in actuality, and it is rarer yet in markets for perishable products. The owner of a perishable product is at a disadvantage relative to the potential buyer in that the owner has to sell the product immediately.

The major portion of purchases in the Hawaii fresh fish market is made by a few large wholesalers. In such a situation, the market is necessarily dominated by the large buyers, and it is natural to suspect them of colluding either to keep the price down or to force the price up when they wish to limit competition. There are persistent rumors in the market environment that the large buyers are indeed colluding by restraining trade and fixing prices, but this could not be verified empirically.

The consensus among fishermen and small dealers is that competition in the fish auction is not keen and might be described as guided competition. Available evidence tends to suggest that there is little competition during the auction.

Thus not only do the large dealers take turns among themselves buying fish, but they must rotate in small dealers so that they too can be supplied. . . . If there is not very much fish in the market, or if there is an adequate amount of which is very good quality, dealers will split a purchase, each taking half of the fish in a can or half an ahi. This means that both dealers get some of the most desired product and that the bidding does not go extremely high with two of them competing against each other. There are fairly standard cut-off points in the bidding process (relative to the general prices for that auction) where dealers will agree to split a fish. If the bidding approaches the level of the highest priced fish of the day, and both dealers still want the fish, the dealer who has bought the least amount that day (i.e., the person in an inferior position) will say "half-half?" Any of the dealers could ask another dealer for the favor of splitting a fish; however, there are regular partnerships where two dealers often agree in advance to split the best fish of the day. The dominant dealer will then make the purchase, and share out with the other dealer at no extra cost. . . (13). (Emphasis added.)

Although positive collusion is difficult to establish or verify empirically, it is obvious that there may be colluding tendencies among the dealers. Persistent hearsay all points to the same conclusion. Reportedly, before the start of the auction, several dealers go through the motions of indicating what is available, what price to bid, and so on. Fishermen complain that there may be a minimum price set for their fish in the auction without their participation in the process.

ALTERNATIVE MARKET SYSTEMS

The present system is basically an auction system and, on the surface, appears to be fairly costly from the viewpoint of the fishermen. The auction assesses a service charge, or commission, that amounts to approximately 11 to 12 percent of a boat's gross receipts. It would be naive, however, to believe that revenues to fishermen would be increased if the auction were bypassed and sales made directly to fish dealers or retailers. Historically, auctions have been the most efficient form of market for perishable products: a central location where information on supply and demand can be brought together and prices determined is a necessary condition for a well-functioning market. It would be difficult, if not impossible, for the individual seller to survey all potential buyers and still dispose of the product rapidly. Also, the individual seller would have to communicate with all other sellers to gain an idea of the supply conditions and the going price. In sum, the price-making mechanism of the market is all-important in permitting the rapid and equitable transfer of commodities. When the commodity is of diverse quality and quantity, the auction system has generally out-performed all others.

This does not imply that all fish should pass through the auction or that the auction is the only feasible form of wholesale marketing for fish. It is only necessary that a sufficient quantity of fish flow through the auction so that an accurate price can be determined. In general, there is often a significant flow of produce directly from producer to wholesaler or retailer, but usually at a price based on the current auction price. In Hawaii, an undetermined number of fishermen sell directly to the fish wholesalers, and these fishermen claim that they dispose of their fish at the auction price.

The existence of alternative channels for fish would permit the fishermen to choose between receiving a possibly lower price or receiving the auction price and paying the commissions to the auction. The existence of alternative channels might also provide some pressure for the auction to either lower its service charges or provide more services than it does presently.

The existing auction system also has certain disadvantages that argue for the development of an alternative market channel for fresh fish. Among the most important of these disadvantages are the following:

1. The auction is scheduled too early. The auction is currently, and the authors believe necessarily, scheduled for early morning. For fishermen who arrive in port after the auction closes or later in the day, the fixed schedule means that they will have to incur the cost of storing their fish till the next day and take the risk of possible deterioration.
2. The consistently successful fisherman is not rewarded. No discount for services rendered is given for large quantities of fish; thus, the successful fisherman may be subsidizing the services rendered to the less-successful fisherman. However, since the fish are identified by boat, the fisherman who consistently brings in fish of superior quality can be identified by the buyers and may earn a premium for his fish. (In fact, a tendency for some boats to receive consistently higher prices was observed, but it was not statistically significant.)
3. Auction markets have been subject to collusion on the part of the buyers. Collusion appears to have a tendency to occur in all auction markets, and public regulation in the past has been only partially successful in eliminating it. The existence of alternative markets for the products usually implies relatively more bargaining power for the sellers, and, thus, the impact of any collusion on part of the buyers can be lessened.

However, the auction system also has strong points: not only is it one of the most efficient mechanisms known for determining price, but also, in some situations, the auction can provide services to fishermen that are not readily available elsewhere. In Hawaii, this has been especially true in the area of finance. According to some fishermen, conventional lending institutions have not been prepared to finance the credit needs of fishermen without large collateral. The auction company, on the other hand, has helped fishermen finance such things as major boat repairs and maintenance, purchase of new equipment, and construction of new vessels. The auction company has also occasionally acted as cosigner for fishermen.

One obvious alternative to the present system of marketing fish is the formation by fishermen of some sort of bargaining agency. This could be a cooperative or a marketing association that could provide fishermen with sufficient countervailing power to be able to negotiate the price of their products. Such an organization could contract a representative, whose responsibility would be to keep in touch with market conditions and to negotiate the best possible price for fishermen.

Efforts have been made in the past to organize fishermen into an effective bargaining group, but these efforts all failed, generally due to the heterogeneous nature and characteristic individualism of fishermen. Although fishermen can be identified by technique or by types of fish caught, these classifications do not necessarily identify groups with similar interests or goals.

Regardless of the failure to organize fishermen in the past, there are indications that such an organization could improve the bargaining position of fishermen. The minimum prices negotiated by the Tuna Boat Owners' Association for aku is one example of the possible benefits that could be gained by a fishermen's organization. Better prices is just one of the possible benefits. Such an organization could also provide credit to its members, enter into promotional activities, act as a legislative advocate for the fishermen, and more.

Fishermen in the rural areas of Hawaii presently earn extremely low incomes. In recognition of the problems of smaller commercial fishermen, the Office of Economic Opportunity has started the Mil-Ka-Ko Rural Demonstration Project Fish Program, representing the project area of Milolii, Ka'u, and Kona, on the Island of Hawaii. Similar projects have been implemented on the Islands of Molokai and Maui. This fishing cooperative indicated that none of the incomes of its 60 members exceeded \$5000 and incomes typically are in the neighborhood of \$1000 to \$2000 per annum.

One of the objectives of Mil-Ka-Ko is to organize as many as possible of the low-income, full- and part-time commercial fishermen of the project area into a viable cooperative. The

fishermen would thus be able to act as or obtain their own "middleman," bringing them closer to the final consumers and enabling them to gain more of the ultimate profits from their fish and related production.

A market system, as the link between suppliers and consumers, is necessarily sensitive to any change in supply or in demand. A change in the infrastructure of an economy is accompanied either by changes in the existing marketing network or by the development of new marketing channels. If the demand for fish were to increase significantly, the marketing system would have to expand accordingly.

Currently, neither fishermen nor fish dealers advertise their product. Possibly the demand for fish could be increased if mass media--radio, television, and newspapers--were used to increase the public's awareness and interest in fish.

The adoption of a technology by the fishermen that either reduced their costs or increased their catch would also affect the marketing system. Increased volume would necessitate improvements in the physical handling facilities of the existing system and would affect the price of fish. Reduced costs would improve the fishermen's profit rates and their competitive bargaining position.

Given the current state of Hawaii's fishing industry relative to the technology employed in other fisheries, the adoption of modern technology is the change most likely to occur. It is impossible to predict with any accuracy what impact a major technological innovation would have on the market and the industry, but a possible scenario can be developed: if a few fishermen were able, by some innovative means, to increase their efficiency and catch significantly, the following chain of events might occur.

1. The increased volume of fish available for sale would force the price down.
2. The lower price would lower profit rates on all boats and make continued operations infeasible for some.
3. Older boats using inefficient methods would be the worst hurt, while it is possible that innovative boats would not be hurt at all; in fact, their net rate of profit might increase as a result of adopting the new technology, even if the increased catch depressed prices.
4. Many older boats would be forced out of business as a result of the lower prices and their weak financial positions. The fishing industry would then become more concentrated.
5. The individual fisherman's bargaining position relative to the fish buyers would improve drastically; in fact, it is likely that there would be many more buyers than sellers in the intermediate (wholesale) level of the fish marketing.
6. The remaining fishermen would then be in a position to either modify or bypass the existing marketing system if they so desired.

Is such a scenario ever likely to come to pass and if so, who in the industry would be most likely to make the change? New technology is constantly being developed and typical innovators are younger men. Innovations, especially capital intensive innovations, tend to be adopted more readily by younger persons because the pay-off period for the investments is often quite long. Older members of the industry may justifiably feel that they would not benefit from the investment before they retired. The principal reason new ideas are implemented is to increase profitability, and, typically, profits are increased by reducing per unit costs. This is often accomplished by innovations that increase the volume marketed while increasing costs at a lesser rate. That is, cost-reducing innovations often result in fewer persons producing more, that is, a more concentrated industry.

Examples of cost-reducing technologies that are currently being implemented are the use of airplanes to spot fish, fiberglass poles instead of bamboo poles for aku, liquid nitrogen as a refrigerant, and fiberglass rather than wooden boats.

Improved fish-spotting techniques could increase the average catch per trip and shorten the average time spent at sea per trip, thus resulting in a cost saving to the fishermen and an improvement in the quality of the catch. Fiberglass poles are reportedly cheaper in the long run and better than bamboo poles. The use of liquid nitrogen as a refrigerant has been approved by the U.S. Department of Agriculture and results in an improvement in the fish's color and improved shelf life, and it saves both space and labor on the fishing boat. Fiberglass boats have been found to be more efficient than wooden boats in other fisheries and generally have more usable space for a given length.

Can the market be improved? Do alternative systems exist that are more desirable from the viewpoint of society? The answer to both these questions is "no," with qualifications. Particular

markets are the results of harsh Darwinian evolutionary processes and are typically the most practicable system for the given situation. Historically, attempts to change or drastically modify market systems have either failed, with resulting high costs to society, or have necessitated long periods of adjustment at the expense of society. Attempts by the market participants to strengthen their competitive position within the market network, on the other hand, have often succeeded remarkably. Drastic changes in market structures have been effected when accompanied by major changes in the infrastructure of the economy, but usually the change in the market was evolutionary, that is, the market had to change to survive in the new economic situation.

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